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# Transparency in the Nuclear Fuel Cycle

As the world draws closer together through information technology, nations and their inhabitants have greater potential for observing and understanding the actions of neighboring states. Improved information exchange is a tool for avoiding misunderstandings and confrontations. Many countries have exhibited a particular concern about the usage, storage, and disposal of nuclear materials, and several are involved in providing opportunities for monitoring their nuclear activities. Transparency in the nuclear fuel cycle is the cooperative process of providing outside parties with access to information so they can independently evaluate the safety, security, and legitimate management of nuclear materials. Transparency helps to address two questions:

*Transparency monitoring of waste placed at WIPP*

- How can we demonstrate that our country's nuclear activities pose no threat, either by accident or proliferation?
- How do we establish that our neighbor's nuclear activities pose no threat, either by accident or proliferation?

Sandia National Laboratories is a facilitator in the transparency process. Sandia offers a comprehensive array of services that enables countries to implement monitoring activities during all stages of the nuclear fuel cycle.

## Description

Sandia provides an integrated system for implementing transparency monitoring. Interested agencies are encouraged to sponsor Sandia-led workshops as an introduction to transparency concepts. Sandia also works one-on-one with nuclear facilities in designing facility-specific transparency activities. An effective Internet-based monitoring system has been developed for integration of information supporting transparency efforts. The system consists of three basic functional levels: data collection, data storage, and data dissemination. For those applications where either data surety and/or security are a concern, various forms of authentication and encryption are available for application to transmitted data. Web page design that presents clear and concise transparency information to the end user is critical to transparency acceptance. Sandia offers assistance in data collection and web page design to ensure that Internet users will not be overwhelmed with undecipherable volumes of data.

## Purpose

During that last several years, Sandia has worked with the Japan Nuclear Cycle Development Institute (JNC) Office of Nonproliferation to enhance its ongoing transparency efforts. JNC and Sandia have designed and installed an unattended monitoring system at the JOYO Reactor Facility.

*Sandia is a multiprogram laboratory operated by Sandia corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.*
*SAND2001-2869P*

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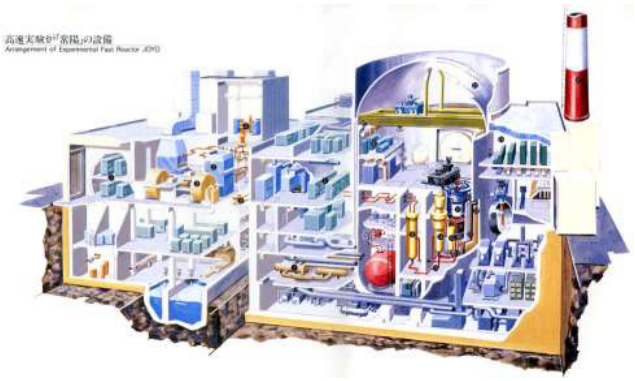
Initially, the system design included only the Spent Fuel Storage Building and required that data acquired by the monitoring system at JOYO be transferred via telephone modem to a remote station at Sandia for review. Transferring large volumes of data and video images using this modem-based data transfer function consumed many hours of communication time. The system design was expanded recently to include sensors in the Fresh Fuel Storage Facility and upgraded to use an Internet-based material monitoring system developed at Sandia. The upgraded system will eventually allow direct access to the data dissemination component using the Internet as a communication medium.



*Schematic of JNC's Experimental Fast Breeder Reactor (JOYO)*

As the world's only licensed and operating geologic repository for disposal of nuclear waste, the Waste Isolation Pilot Plan (WIPP) near Carlsbad, New Mexico, USA, offers experiences in coping with real life conditions in an operating facility. The WIPP transparency system is typical of a configuration that might be chosen for public acceptance transparency. A distinguishing feature of the WIPP transparency system is that it is Internet-accessible – the public potentially can find the site through search engines. The web viewer can observe near-real time video sequences of activity around a stack of simulated waste drums and can call up archived images as well. Video surveillance cameras can trigger themselves when activity starts or can be triggered externally by sensors or operator commands. Sensors attached to the drums monitor motions and temperature. In addition, environmental information affecting both the container below ground and the public above ground is available.

## Transparency Opportunities

- Process Monitoring - nuclear facility operations, operational safety, nuclear materials accounting
- Transportation Monitoring - cask/container integrity, shipment location
- Storage Facility Monitoring - nuclear material emplacement and exchange, facility access
- Environmental Monitoring - airborne radioactivity, daily radioactivity, data, emergency warning

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